

solplan review

the independent journal of energy conservation, building science & construction practice

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The Simple House



From the Editor . . .

I was trying to think of some profound thoughts for this issue. But over the holidays I attended a number of parties, some at commercial establishments, and I made an observation that may have some bearing on what we are or are not doing in the housing sector.

I may be betraying my age, but at some parties (where the average age of the crowd was somewhat younger), the music was cranked up loud; so much so, it was painful (at least to this old codger). I couldn't help but notice that the louder the music went, the more the people responded.

It seems that the younger generation can't respond to music quiet enough you can talk over. At the sound level of the music, if you wanted to carry on a conversation it was necessary to scream at the top of your lungs to the person standing two feet in front of you. An environment conducive to intelligent conversation? Of course, at those sound levels, there is little critical judgement about the quality of the music, as the only thing you can react to is the sound pressure of the throbbing bass, any melodic line having been drowned out.

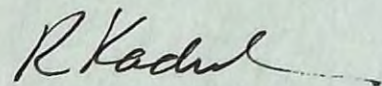
It is an established medical fact that prolonged exposure to loud noise will impair your hearing permanently. That is why workers compensation regulations require ear protection when working with some types of equipment. However, there are no such regulations governing pubs, night clubs, or even personal walkman type stereo devices. (I personally on occasion have resorted to ear plugs in a night club!)

So what's all this got to do with housing?

In the past I've expressed my concerns about manufacturers that don't pay attention to the quality of their products; noise levels being one important criteria. For example, we know that bathroom fans and kitchen range hoods are seldom manufactured with noise criteria as a concern. We also know that purchasers of R-2000 homes that have brought their old household appliances into their new quiet, draft free homes have discovered to their dismay that the appliance noises in their older houses were masked by outside noise.

Perhaps mechanical manufacturers are ignoring developing quiet equipment intentionally, knowing well that the next generation won't worry about noise levels because they'll have lost a good portion of their hearing in their youth? (Not unlike the North American automobile industry driving public transit out of business in the 1930's to ensure a steady supply of customers for their cars). After all, why bother investing in quality product design if you can get away without it?

Then again, what is music for one person, may be noise to another, which is why sound separation is such an important concern in multi family housing; and why we see so many custom houses being built with acoustic separation between areas within the house.



Richard Kadulski,
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The Simple House

by Dr. Ted Kesik, P.Eng.

The next significant advancement in housing technology will be the Simple House. It will provide answers to a host of simple questions.

Why do we build with materials that contaminate indoor air and then use mechanical ventilation to make the air quality acceptable again?

Why did we develop high performance windows and then ignore passive solar heating and daylighting?

Why do we design and build kitchens and bathrooms that invite remodelling and renovation?

Why are we heating our homes with technologies designed for inferior quality building envelopes?

Why does our housing have so much wasted space, and generate so much waste?

Why do codes and standards become more difficult to interpret, and less cost effective to apply and enforce?

These are just a few of the simple but tough questions the Advanced House program will have difficulty answering - and rightly so, as these are not part of

its intended objectives.

That is why I am proposing a Simple House program. Its objectives would be to create healthful, sustainable, adaptive housing relying on passive technologies - the most important being simple, elegant design. Good design represents value added which requires no maintenance, consumes no energy, and improves the quality of life. Good design does not deplete natural resources, generate greenhouse gases, contaminate water tables, and then end up in our landfills.

The idea is simple, but can it be kept simple? Not if it costs too much money and people take it too seriously. (Just look at what happened to our game of hockey!)

What I would like to propose is a grassroots extension of the sort of common sense simplicity undertaken by Avi Friedmann in the Grow Home. The notion is to develop regionally appropriate, simplified housing technology. Not minor tinkering, but a complete re-thinking of design and homebuilding in each market. This implies building the sort of

housing we need, not necessarily the housing we want. It should be sufficiently adaptive, however, to later evolve affordably into what we, and the generations which follow, may want.

To keep it real, no one should get paid unless it is with savings from simplification - builders' rules should apply to everyone. Open, non-competitive processes without artificial deadlines seem to work best. It is also recommended never to exclude anyone willing to contribute at any stage of the process. The Advanced House program lost a great deal when it adopted a competitive, exclusive posture. I would also suggest that people avoid involvement unless they have a passion for simplicity and are willing to leave all preconceived baggage at the door. The Simple House is unfettered common sense applied simply to modern housing design and construction.

I have likely missed a few ingredients in the recipe, government seed funding being the most important among them. The Simple House would not be seeking a half a million dollar subsidy per house

like the Advanced Houses. Instead it would apply on a house by house basis to cover eligible expenses associated with transferring simplified, house-as-a-system concepts, up to a maximum of say, \$5,000 (that's 100 grassroots Simple Houses for the average subsidy on a single Advanced House). Technology transfer is all that I am willing to see my tax dollars support - the other investments in simplification either make sense or simply should not be made.

The Simple House would be built within real market constraints. That means interested builders would hook up with design professionals and deal with some of these questions on the drawing board and in the field - simply, practically, affordably. The capacity for this process already exists. There are a large number of R-2000 professionals who have a great deal to contribute, and given their experience, really should be catering to the whole building industry, rather than just to those who build R-2000 homes.

Yes, homebuilders' associations do have a role in this. They should be politically active in suspending extraneous building regulations to permit sale and occupancy (as was done on many of the MARK home demonstration projects in the past), lobby banks to offer more creative financing of these projects, carry some liability insurance (we learn by making mistakes), and review Simple House applications through technical research committees that actually get involved in, and promote, real R&D.

Even without government and industry support, the Simple House program makes sense, because it is a real response to what is becoming an unreal situation. Personally, and I know many who would agree, I would obtain greater satisfaction applying my training and education to the simplification of housing, rather than using it to analyze and explain the ever increasing complexity of codes and standards.

So who's interested in organizing a

Continued on page 4

Are There Differences in Fire Safety Between New and Existing Buildings?

by J. Kenneth Richardson, D. Yung and G. V. Hadjisophocleous

Whether or not existing building stock is inherently unsafe because it does not meet current National Building code (NBC) requirements is an important one for the construction industry and one that can best be answered by dividing it into four separate questions:

1. In a fire, are new code conforming buildings safer than older buildings that do not conform?
2. How do we know which is safer? (How do we calculate safety?)
3. Do we need a special code to achieve fire safety in retrofitted or renovated buildings?
4. Because of our extensive stock of older buildings, are Canada's fire losses and costs as high as statistics suggest?

These and other questions are often asked by designers and builders as they wade through the many fire-safety regulations. They are important today as we try to improve competitiveness with international trading partners by reducing

the total cost of fire (losses due to fire plus costs of fire safety). We can't afford to waste dollars on unnecessary or redundant fire-safety measures in our buildings but, at the same time, we have to ensure the safety and security of occupants and also to preserve the existing building stock. Thus, it is important to address all the above questions, especially for those in the design and building community.

Canada's Fire Costs

Canada's annual fire costs are shown in table 1. The data clearly demonstrate

ANNUAL CANADIAN FIRE COSTS	
Direct Fire Losses	\$1.5 B
Lives and Injuries	\$1.2 B
Cost of Fire Services	\$2.0 B
Cost of Building Fire Protection	\$3.7 B
Cost of Fire Protection in Equipment and Operations	\$2.2 B
Other Costs/Losses	\$0.8 B
TOTAL	\$11.4 B

that fire-safety measures, not losses, make up the largest portion of these costs. International studies have shown that Canada's per capita life-loss rate and property losses from fire are among the highest in the world. Both types of losses, in addition to the high cost of fire safety, are a drain on our resources.

The challenge for designers and builders is to find a way of reducing total fire costs or, at the very least, reducing costs without increasing losses or reducing the level of fire safety. In other words, "how do we become more cost effective in our fire-safety expenditures?"

Looking at costs related to buildings, the major difficulty is in separating losses and costs by age of the building as no break-down of age is provided in fire statistics. Thus, on the basis of available statistics or fire-cost data, one can't directly answer questions 1 to 3. However, we know that most reported fires happened in buildings which would likely not meet today's code (NBC) requirements as most of the building stock is over 5 years old (and thus doesn't conform to today's code). What we really need to ask is "are the older buildings really unsafe?" or, put another way, "are they a greater risk to occupants than new buildings?"

By measuring risk to life, and not losses, we can determine comparative safety levels in older and new (code-conforming) buildings.

A Tool for Calculating Safety

FiRECAM, a new modeling tool, allows researchers to calculate risk levels and to answer questions 1 to 3. FiRECAM is a computer-based mathematical model that allows a designer or builder to answer questions about the comparative safety of old and new buildings and to calculate that difference. In the present

regulatory environment, the inability to calculate safety levels (or risk to life) for occupants has been the main reason that building and fire officials have often been reluctant to accept otherwise cost-effective fire-safety solutions as equivalent protective measures.

FiRECAM was developed developed at the National Fire Laboratory (NFL) of the Institute for Research in Construction (IRC) by a team headed by Dr. David Yung of the NFL, in collaboration with Victoria University of Technology, Melbourne, Australia, with the support of Public Works and Government Services Canada and National Defence Canada.

FiRECAM works by simulating typical fire situations in a building, i.e. all probable types of fire at all locations in the building, and by calculating occupant risk to life and fire-safety costs based on the sum of all these probable scenarios. It simulates fire ignition and growth, the spread of fire and smoke, and fire detection and suppression either by automatic sprinklers or firefighters. The model can simulate the ways occupants respond and evacuate, with or without the help of firefighters. By determining the probability of the occupants being trapped by the fire and smoke and the extent of fire damage, the model is able to make a calculation of the risk to life and the costs of fire. This information allows designers to evaluate the cost-effectiveness of fire-safety decisions.

Details of a code-conforming building equivalent in size to the building being assessed, are used as the baseline for assessment of design options either for the renovation of an existing building or for a proposed new building. Details of the proposed project are input, and calculations made to compare the risk to life to that of the code-conforming building. Different design (or technology) options can be used to compare and thus determine which provides the most cost-effective solution for a particular project, assuming that the proposed design is at

least as safe as the code-conforming design.

FiRECAM allows for a complete risk analysis looking at all fire safety features in a building - not just those that are deficient according to the building code. In an older building, for example, credit is given to those features which may exceed present code requirements, such as wider stairs, less flammable finishes and heavier construction. It also evaluates features which may be deficient and increase risk. This holistic approach yields measures of expected risk to life and costs - both the cost of fire safety and the economic cost of any losses.

With this tool for calculating risk (or safety), whether a new proposed building is safer than an older existing one can be determined. This method also deals with the question of the need for a special code to ensure fire safety in retrofitted or renovated buildings. It is clear that if there is a tool to calculate risk, then only one code is needed. All fire-safety options can be considered using this tool, using the safety level intended by the code as the benchmark.

Example of a FiRECAM analysis

An example demonstrates the versatility of FiRECAM. A subset of fire safety options - the fire resistance of the structure, a fire-detection and alarm system and a sprinkler system - was assessed for a three-storey wood-frame apartment building in Australia. The expected risk to life, a measure of the potential risk to occupants averaged over the life of the building; the expected cost of fire is the total of capital and maintenance costs of the fire-safety provisions plus the value of any fire losses over the life of the building were calculated.

Figure 1 shows the comparative risks and costs of four fire-protection options.

Option 1 is the code-conforming option - one-hour fire resistance, a fire-

detection and alarm system and no sprinklers.

Option 2 represents an apartment building which has no alarm and detection system, no sprinklers and minimal (20 minutes) fire resistance. The risk for this second option is 152% higher and the fire-safety costs 44% lower, as there is minimal fire safety incorporated in this building. This alternative is less safe than a building conforming to the current building code (Option 1). To upgrade this kind of building, a designer must examine the risk and cost implications of additional fire resistance, an alarm system and sprinklers. These risk and cost implications (of providing both additional fire resistance and alarms) have already been calculated in Option 1.

Option 3 describes the effect of adding only a sprinkler system to a building with minimal fire resistance (20 minutes) and no alarm system. As can be seen, the risk is 17% lower and the costs 8% lower than for code-required levels of safety as described in Option 1.

Option 4 describes a building with additional fire resistance and sprinklers but no alarm system. This approach results in a substantial fire-cost increase with only a minor (9%) further decrease in risk compared to Option 3.

The assessment of different fire-safety measures indicates that for this three-storey wood-frame apartment building, option 3, where the sprinkler system is

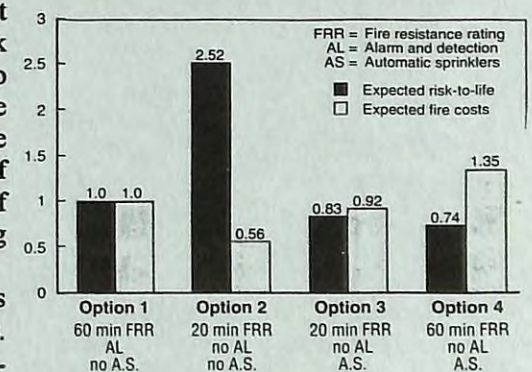


Figure 1 Comparative Risks and Costs

Continued from page 3

Simple House bee in their community? If the answer is nobody, then home builders and regulators should stop their whining and graciously offer to be swallowed by the impending chaos. And if nobody is interested in living in a Simple House, then we will know the true cause of our present dilemma - a failure to educate consumers about the real issues in housing.

The Simple House is not intended as a criticism of the Advanced House - no one is suggesting that the insights gained from this program are anything but worthwhile (although a little more technology

transfer of these insights would be nice). The Simple House is simply a grassroots response to state-of-the-art, leading edge technology - the flip side of the advanced housing technology coin.

In the end, it will demonstrate to government, industry, and consumers, if Canadians are capable of running a simple house. ☼

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used alone without additional measures, provides the needed safety to reduce risks to an acceptable level (as intended by the building code) and also to reduce the costs of fire.

Conclusions

Are new buildings safer than older ones? The answer is "it depends", but we can discover what factors make one building safer than another. While many existing buildings are not code-conforming, they may be as safe as buildings that are; the description of option 3 could also be applied to an existing building with fire-resistance and alarm deficiencies (as defined by the current building code). Such a building is, in fact, safer than a new code-conforming building because of the added sprinkler protection.

We have found that older existing buildings may be safer than new code-conforming buildings; the tools to calculate risk and determine the comparative safety of buildings are available; and a special code for retrofitting or renovating buildings is not needed, as long as we can calculate risk and thus determine safety levels.

Canada's fire losses and costs are as high as statistics indicate, but with new tools, losses and costs can be reduced by investing in the fire-safety strategies that provide the greatest potential for reducing loss and cost. ☼

J. Kenneth Richardson is Head of the National Fire Laboratory at the National Research Council's Institute for Research in Construction. D. Yung and G. V. Hadjisophocleous are fire researchers at the National Research Council's Institute for Research in Construction.

How Reliable are Heat Pumps?

Heat Pumps have a reputation for being complex and requiring lots of servicing and maintenance. A Norwegian contractor in the Oslo area had a staff of 12 to service 1200 oil boilers in the 1960's. Today the service and maintenance of 1500 heat pumps (average size 20 kW) are handled by one person!.

Efficient Residential Exhaust Ventilation

by David Hill

One of the most commonly discussed housing issues today is how much ventilation is really required during the heating season? Confusion is increased because of the wide range of house sizes built today to accommodate one 'family'. We can only begin to set ventilation rates when we realize we can't count on opening a window to provide reliable ventilation and once we realize that no amount of ventilation can ever perform the impossible task of adequately diluting the ongoing emissions of unhealthy interior building finishes.

A comparison could be drawn using the American auto industry's 'pony cars' of the early 1970's. Some had engines claiming 400 horse power, but today their performance is easily matched by sports cars which use much smaller 200 horse power engines. Both cars are equally effective in their performance, but the new cars can deliver their power to the road much more efficiently and smoothly using half the horse power and half the fuel of the 'pony cars'.

In a similar way, the observant ventilation designer/installer recognizes that many of his peers today are wasting ventilation horse power. They lack the understanding to install and operate systems that could make efficient use of the ventilator's power, so that these installation strategies make inefficient use of the ventilator's cubic feet per minute (cfm) capability. As a result a ventilator is often oversized in an attempt to compensate for the cfm's they've failed to harness.

The issue of ventilation flow rates is further complicated because there are two concerns, even though many believe that there is only one. The first are the rates required to exhaust odours and moisture from human activity (cooking, shower-

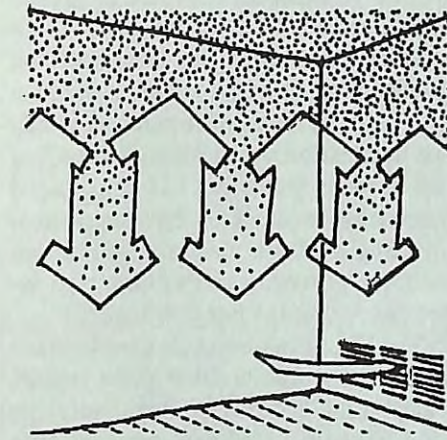
ing) and second, the general exhaust rate required for human metabolic (living) processes. These are two separate ventilation needs which must be looked at separately. The purpose of ventilation is to effectively control both types of indoor human-produced pollutants.

Most people realize that there is a real need for localized exhaust ventilation in the kitchen and the bathrooms. The kitchen/bath fan industry has been meeting this need in Canada for many years. They have only remained in business because they have met that activity need. For effective short term exhaust, the consensus is in: fan 'paper cfm ratings' (unsubstantiated cfm claims) are fantasy; the installed cfm is the reality; and bigger is better - as long as chimney safety problems are not created during use.

In the case of continuous ventilation for human living there is much controversy in determining what the appropriate rate should be. One of our common assumptions is that all ventilation installation strategies are equally effective. We are interested in the efficiency of the box (ventilator) but we give little thought to the effectiveness of the system it powers and how this affects the rates required.

Whatever installation strategy is selected, a ventilation system must control condensation and keep the house fresh in order to be effective. The installation strategy is the variable that will determine the efficiency of the system. It is high-time we examined these different ventilation strategies, to determine the rates which must be maintained to achieve equal results (effectiveness) in each system.

In most houses, the worst air (most in need of being exhausted) collects at the ceiling level. In the kitchen and bathrooms, heat from cooking and showering lift the odour and moisture to the ceiling.



In the living areas such as the dining, living and bedrooms, body pollutants originating from people ('unvented combustion appliances') are lifted by the 100 watts of body heat generated by each person.

In most homes, even if the heating system is forced air and its blower is running continuously, there is little to disturb this layering because the air mixing from inexpensive residential floor grills is poor. Our rating of fresh air is determined by the air quality our 'nose sees' and not the air that our feet feel. Further, the public demands that the lowest (i.e. quietest and least draft producing) speed is selected for the continuous circulation blowers. Thus, the ceiling level mixing is reduced even further.

One can see intuitively that exhausting the stale ceiling would be more effective than exhausting clean and still unused air from a grill located low on the wall. If the exhaust air is drawn from high level grills in the service rooms (kitchen and the bathrooms) after being transferred from adjacent living areas, the heated indoor air can be used twice before being exhausted.

Efficient ventilation logically requires exhausting, preferably continuously, the ceiling areas of service rooms. If a duct connection for the continuous exhaust system is located anywhere else (for example, a return air grille at floor level) it will handicap the system's ability to remove interior contamination. Further, if

the continuous exhaust system takes air far from the point where the odours and moisture are generated (i.e. not from the kitchen and bathrooms but somewhere in the central hall) then the odours are not exhausted 'at source'. Since that air would be 'less used', higher exhaust rates would be needed to remove the same contamination. The system would be much less efficient as a result.

This kind of inefficient approach increases both the capital and operating costs of the system: a higher cost for the larger ventilator required to move this air and more fan electrical energy and space heat energy would be consumed to accomplish the same goal.

Another factor that affects ventilation efficiency is duct quality. In Canada we have assumed that the exhaust flow rates measured at the central ventilator represent the true exhaust rates which are serving the occupants. But trying to attain efficient ventilation requires that we ask: how much of the air exhausted from the house is actually drawn from the specific rooms and locations in these rooms (above nose level) where exhaust is actually needed? And, perhaps more fundamentally, how much of the system capacity is really lost through duct leakage, which ultimately only pulls out clean and heated air from the wall and joist cavities?

Forced warm air heating system ducts, installed professionally, have generally been adequate for heat. However, when used for ventilation purposes these ducts will only be adequate if they are thoroughly duct sealed with a water-based, paint on sealant.

It is assumed that ventilation systems installed to CSA F326 requirements are effective without distributed exhaust ductwork (when the exhaust is connected to the furnace return air), or when used with distributed exhaust ductwork, without the application of duct sealant. The performance of some of these systems, however, has been shown to be only 50% effective. Would it not be possible to assume, then, that a ventilator of half the capacity but with properly designed, sealed

ductwork and ceiling level exhaust grills located in the service rooms could perform just as effectively?

Field testing in B.C. over the last three years has shown that the sum of the individual grill airflow measurements often only represents 40-60% of the system capacity as measured at the central ventilator - the rest represents leakage. In some cases, even when the whole system has been ducted correctly, but without duct sealant, leakage has been as high as 70%.

If plumbing pipes were installed to the same standard as our current central ventilation ducting systems, when you flush upstairs half the contents would end up on the basement floor!

There is now a tool to quickly and accurately test how airtight ductwork is. The Duct Blaster is a smaller version of the blower door which can perform a 50 Pascal (blower door) test of the homes' ductwork. It is accurate and easy to perform. The main difference between this test and a house airtightness test is that the duct sees the 50 pascals of pressure continually while the house envelope must withstand only 10% of this test condition during normal winter conditions.

Maybe it's time to review the ventilation rates required not just based on the ventilator capacity but also the type of installation strategy selected. This would acknowledge the variation in efficiency of these different installation strategies. Perhaps it also would be timely to use the Duct Blaster to test the duct leakage performance of a larger number of homes.

The 'neigh-sayers' are to be reminded of the pony cars... ☼

David Hill is President of Eneready Products Ltd., a residential ventilation systems distribution company in Burnaby, B.C.

R-2000: the Healthier Home

The R-2000 home is a draft free energy efficient home that also has a better quality indoor environment. The R-2000 program was designed as an energy efficiency home initiative, but it was noted quickly that homes built to the program's technical standards also provide a more comfortable and healthier environment due to the better quality materials and good mechanical ventilation systems.

CMHC's Healthy House initiative has pointed out that attention to energy efficiency, details and the proper selection of finish materials contributes to a healthier indoor environment. The R-2000 technical requirements were modified last year to introduce healthy house concepts, so that the R-2000 house can be considered as a healthy energy efficient home. It appears as if the R-2000 and Healthy House concepts are coming together, which would be a positive step forward for both the building industry and the Canadian public.

In recent years many new products and materials are being used that didn't even exist a generation ago. We are finding that with today's construction practices and materials in the average house the indoor air quality inside is getting worse. The concern about indoor air quality is there because fresh air is something we can't live without. We don't realize it, but on average we consume about 54 pounds of air per day - 10 times more than food or water!

Fortunately, there is something we can do about it: not only dilute the emissions by ventilation but also, more importantly, control the source of emissions. If an unhealthy product must be built into the house, its effects may be somewhat neutralized if it is sealed. Ventilation should not be relied upon to create the healthy indoor environment.

The new R-2000 requirements are not meant to deal with the concerns of people with extreme environmental sensitivities, but are intended to provide a healthier

living environment for the general population. They don't deal with all of the potential problems, but they do point in the right direction.

In the spring of 1994, nine Halifax area R-2000 home builders, under the direction of Clayton Developments Ltd., built thirteen show homes which married "healthy" and environmentally friendly building practices with energy efficient construction. All of the houses were built and financed by the contractors on a speculative basis. The public reacted enthusiastically to the concept, as was noted by the quick sales of the houses and resulted in a total of 21 homes being built to project standards.

Although these homes were not built specifically to meet the needs of those with serious health problems caused by environmental sensitivities, the experience of at least one owner is very encouraging. It underscores the impact that a better indoor environment can have on a person. This individual is asthmatic and prior to moving into her new house had been taking three types of medication to treat her condition, and also spent up to three hours per day in five to six sessions on a vapour mist machine through which she inhaled two aerosol drugs to help her

breathe. In addition she suffered greatly from hives.

Since moving into her new home on August 26th, she now requires the mist machine only once per day and takes only one medication. In addition, for the first one in many years that has not suffered from either severe bronchitis or pneumonia. She and her doctor attribute her recovery primarily to the improved indoor air quality of her new house.

The Halifax showcase homes were not drastically different from other homes, except that certain products were not used. These included: urea-formaldehyde floor underlays; petroleum based flooring adhesive and finishes; and urea-formaldehyde bonded products for cabinets or shelving unless measures to seal in emissions from these materials were taken.

These Halifax homes underscore the importance of a healthier home, and point out that with just a little care and planning it can be built into market housing.

It is interesting to note that Health Canada, NRCAN and CMHC are sponsoring a workshop to look more closely at the health implications of energy efficient housing. The one day workshop (March 3, 1995 in Ottawa) will bring health professionals and building experts together to explore the issue. We will have information on the results of the workshop in our next issue. ☼

Formaldehyde

One of the major problem materials is formaldehyde. It is one of the most commonly used industrial chemicals, which occurs naturally in low levels and is found in many manufactured products such as particle board, chip-board, upholstery fabrics and foam, furniture, tobacco smoke, cosmetics, fabric treatments, clothing, and household cleaning products.

The emission rate of formaldehyde emissions from any surface is dependent on the temperature, relative humidity, existing formaldehyde concentration in

the air, age of the material, exposed surface area, and degree of encapsulation.

The degree of encapsulation can greatly reduce formaldehyde and VOC emissions. Products with low permeability can reduce the formaldehyde emission from underlayment to negligible levels. Plastic laminates, if applied to all surfaces, will be acceptable to most people. On the other hand, paints or varnishes do not effectively seal the surface of particleboard or MDF board.

Formaldehyde is an irritant that affects mucous membranes. It affects the eyes, nose, throat and lungs, and occasionally skin reactions. Exposure can

cause headaches, depression, dizziness, loss of sleep, and can aggravate coughs and acts as a trigger to other illnesses such as asthma. Some people can be sensitized to chemical sensitivity by exposure to formaldehyde.

Since formaldehyde is a naturally occurring substance, what are acceptable levels? The table lists naturally occurring

formaldehyde levels, what are considered acceptable levels, and

There are times it is not possible to avoid the use of particle board, with its high formaldehyde emissions levels, but it is possible to seal the material. The effectiveness is only as good as the job, and it is important that ALL surfaces must be sealed. The most effective sealing

strategies are (in decreasing order of effectiveness): plastic laminates, melamine, vinyls, finished wood veneer, commercial grain printed coatings, heat transfer foils and films, oil based or lacquer finishes.

Obviously, some of these coatings, especially the vinyls could themselves be a source of emissions of another type, and should be avoided. ☼

Common Sources Of Formaldehyde in the Home

The following table lists common products found in the home or used in construction. The emission rates are in micrograms per day per sq. metre of product. It may be difficult to appreciate the actual quantities, as they are only understandable by technicians in the laboratory, but they do indicate the order of magnitude of the emissions from various substances.

MDF Board	17,000 to 55,000
Hardwood Plywood panelling	1,500 to 34,000
Particleboard	2,000 to 25,000
Urea-formaldehyde Foam insulation	1,200 to 19,000
Softwood Plywood	240 to 720
Paper Products	260 to 680
Clothing	400 to 470

MDF Board (Medium-Density Fibre-Board), a component of which is urea formaldehyde, is generally considered to be worse than particleboard, due to its higher concentration of glue (about 9% by weight of the finished MDF board). MDF's half-life (the time it takes for half of the VOC's to off-gas) is about twice that of interior plywood panelling. Although it may contain a wood waste product, the health effects outweigh the environmental benefits.

However, some MDF sheets are made with exterior binders that are less affected by moisture, so they off-gas less. These may be classed as "low-emission" or "European-standard" materials, and some are made using no formaldehyde based glues at all. Sealing by hard laminates or by coating with several layers of non-toxic finish can reduce formaldehyde emissions by up to 95%. However, all surfaces must be covered. ☼

Table: Formaldehyde concentration levels (ppm = parts per million)	
Source	Formaldehyde level
Clean rural air	0.008 ppm
Outdoor air, urban area (summer)	0.1 ppb
Level some people can sense	0.05 ppm
Measured levels in average new homes	0.04 - 0.15 ppm
Health & Welfare Canada target level	0.05 ppm
Health & Welfare Canada action level, German standard; ASHRAE guideline	0.1 ppm
US Dept. of Housing & Urban Development guidelines	0.3 ppm
Level most people can smell	1 ppm
Levels measured in some homes	1-1.9 ppm
Extreme irritation & adverse effects	10 ppm
Cigarette smoke	40 ppm

For further information on the R-2000 Program, contact your local program office, or call:
1-800-387-2000
(Fax 613-943-1590)

We would like to thank Thomas Livingston with assistance provided in the preparation of these items.

Next issue we will continue with a discussion of some of other building products for healthier indoor environments.

Healthy Materials: an introduction

What are healthy building materials? Do they really have any impact on the indoor environment? We've been building houses for many years, and people haven't been dropping dead, so is this really a big issue? What are the common indoor pollutants and why are they of concern?

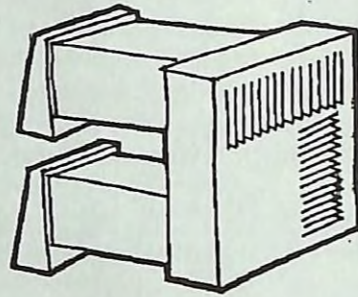
Pollutant	Health consequences:
Biological Contaminants: fungi, moulds, pollens, mites, bacteria, etc.	allergy responses; respiratory illness; some fungi can sensitize healthy people.
Toxic Metals: Lead in paint; arsenic in pressure treated lumber; cadmium; mercury; zinc; chromium.	attack nervous system leading to trembling, loss of muscle control, headaches, nausea, blurred vision.
Mineral particles: Asbestos; fibreglass fibres; airborne calcium particulates from humidifiers; other man-made mineral fibres.	lung diseases; emphysema; some are carcinogens; heart strain.
Gasses: Radon, cigarette smoke	higher risk of throat and lung cancer when inhaled
Volatile Organic Compounds (VOC's) - these make up a large family of chemicals including some of the hydrocarbons, usually derived from petroleum or natural gas, and the synthetically-derived alcohols, benzene, toluene, etc.); organochlorines (PVC, PCB's):	wide range of symptoms similar to allergies, chronic illnesses, damage to immune system, some are carcinogens and other life threatening reactions.
Formaldehyde:	pungent, irritating gas affects eyes, nose, throat & lungs and skin reactions; headaches, dizziness, loss of sleep; can sensitize healthy persons.
Gasses: Carbon monoxide (CO); nitrogen oxides (NO _x); sulphur dioxide (SO ₂); ozone (O ₃); carbon dioxide (CO ₂).	small amounts may cause headaches, intoxication & breathing problems; at higher concentrations neurological & respiratory illness, and death.

Energuide Labelling of Equipment

Regulations are being developed to establish national minimum energy efficiency standards for a wide range of energy-using equipment. Under the proposed regulations, some types of equipment will have to display a label that provides information on the products energy consumption.

In the case of heating, ventilating and air-conditioning (HVAC) equipment, minimum energy efficiency standards

have been established for oil, gas furnaces, ground and water source heat pumps, internal water loop heat pumps, room air-conditioners, and single package and split-system central air-conditioners and heat pumps. For the time being, however, the labelling of HVAC equipment will not be regulated by the federal government. Instead, an industry-managed energy efficiency rating system is being jointly developed by Natural Resources Canada and the Heating, Refrigerating and Air Conditioning Institute of Canada (HRAI).



HRV Update

Old timers in low energy homebuilding (or at least those who go back to the mid 1980's) may remember the Star heat exchangers. The company was one of the early pioneers of the business, with a range of products that featured innovative automated controls.

One of their products suitable for special applications was a small through the wall HRV marketed as the 'NOVA'. We recently discovered that the product is still being manufactured by a Newfoundland company.

This compact wall mount HRV (model 1000) incorporates a polyethylene core, draws 49 watts maximum, and features variable speed control and automated defrost. It has a rated capacity of 70 cfm recovering up to 75% heat. It retails for around \$ 500.00.

This is not a ducted central ventilation system. It is suited for small units such as mobile homes, cottages, offices, motel rooms or simple rooms. (I only wish more motels would use this kind of system for air rather than the jet engines so typically found masquerading as air conditioners and guaranteed to keep you awake!)

*Information
Anderson Products Ltd
Port Aux Basques, NF
Tel: 709-695-7801
Fax: 709-695-3308*



**Canadian
Home Builders'
Association**

Plastic vent pipe update

A number of plastic vent pipes used with mid efficiency gas fired heating appliances have been delisted by ULC. A new replacement product is being tested. It is hoped that results will be available next month.

Air-Barrier performance guidelines

We've known the importance of air barriers in construction. However, there have not been any tools by which to assess the effectiveness of an air barrier. Performance guidelines have now been developed by a group that included CHBA and a number of product manufacturers. The guidelines will be used by CCMC to evaluate specific products and building systems. Test results will be published in the CCMC Registry.

Envirohome update

We've reported on the Envirohome demonstration project. The first two full fledged demonstration projects, one in Edmonton and one in St. John N.B. have been completed and open to the public. Initial indications are that there is considerable consumer interest in these houses.

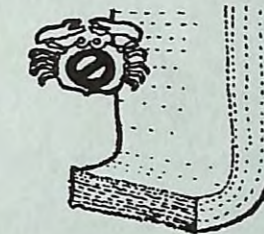
The technical criteria for each house is that they have to meet (and be registered as) an R-2000 houses, but all environmental and indoor air quality pick-list features must be incorporated into the project, not just a selection. These houses have been able to incorporate presently affordable technologies. There is some interest in expanding the technical requirements. These could include alternative energy and consideration to consider the embodied energy content of materials.

Technical Research Committee News

National Energy Code

This model code is being developed as two separate documents: one for houses (which would essentially cover all Part 9 residential buildings) and one for buildings which covers all other building types and larger size buildings covered by Part 3 of the Building Code. The second draft of the document is expected to be available in early May for public comment.

Anyone interested in reviewing the proposed document can contact the Canadian Codes Centre, Institute for Research in Construction, National Research Council or the Technical Research Committee.



Is Fibreglass a carcinogen?

The US Department of Health and Human Services has listed fibre glass as a potential carcinogen. Needless to say, such an assertion has generated much concern, not just among the manufacturers, but also among those who work with the products as well as the general public.

The listing was made just on the basis of results after fibre glass was surgically implanted into laboratory animals, and without a risk assessment study. There is no comment about the difference in threat to lab animals and people, nor does it consider the threat of inhalation (breathing) or skin contact of fibres compared to surgical implants. However, it is exposure by breathing that is the major potential problem to people (but how many people are in the habit of surgically implanting themselves with fibre glass?).

Animals are usually used to help calculate risks, but what the appropriate

levels to determine the effects of a given substance is often an issue of some debate. Adverse effects of glass fibres have been noted in animal studies only at concentrations more than 350 times higher than the highest concentrations measured indoors in living areas during the installation of blown rock wool insulation.

A Canadian government report¹ published in 1993 under the auspices of the Canadian Environmental Protection Act assessed mineral fibres. The study included a thorough international scientific literature search.

Adverse effects have not been observed in groups exposed to higher fibre concentrations (such as workers in fibre glass manufacturing) than are encountered in the general environment. Only minimal effects, not adverse, have been observed at concentrations 75 times higher than indoors during glass wool installation. Only in rock wool plants was there a statistical correlation to some adverse effects, but it could be due in part to the contaminants present in the slag materials themselves.

Glass fibres are quite soft, so they break down into smaller pieces and they dissolve in acidic or basic solutions and biological fluids (the stomach contains strong acids, while most of the human body is alkaline). It has been estimated that most small glass fibres will dissolve within 2 years (some in as short a time as 14 days). Most airborne fibres are likely to be removed over time by gravity, and dissolved by liquids.

The conclusion of the study was that glass fibres are not entering the environment in quantities and conditions that may constitute a danger to human life or health.

The bottom line?

Currently available data shows that fibre glass products are safe to manufacture, install and use when standard recommended work practices are adhered to.

¹Mineral Fibres (Man-Made Vitreous Fibres) Priority substances list assessment report, 1993; Government of Canada, Environment Canada, Health Canada.

Electric Radiant Heating Systems Equipment Disconnect Order

The Electrical Safety Branch in B.C. has issued an Equipment Disconnect order for all CSA certified Flexwatt Radiant Ceiling Heating Panels, and all Aztec-Flexel or Thermaflex Radiant ceiling heating panels rated 22 watts/ft².

The Quebec government "recommended" a moratorium on new installations and suggested existing ones be disconnected. This happened as a result of two residence fires this year in B.C. and several in Quebec.

These products had received CSA certification, which has been recalled. CSA will be contracting the services of an independent consultant to assist with a new study of ceiling heating panels, which is expected to contribute to the development of a new standard.

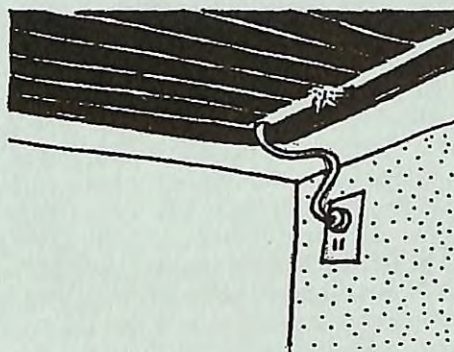
Ceiling radiant heating systems have been widely used in Quebec and B.C. (perhaps up to 20,000 homes in just these two provinces). They have been in use in Europe for more than 40 years and in North America for over 10 years.

Flexwatt Corporation claims to have sold over 15 million linear feet of heating material for a variety of heating applications throughout North America and Europe. They believe that the cause of the field problems is attributable to a combination of violations of the installation instructions and "as yet to be determined other extraneous factors."

However, it is important to note that ceiling radiant heating panels can still be used, subject to a few restrictions. The disconnect order does not apply to ESWA or ThermaRay products.

ESWA and ThermaRay radiant ceiling panels are recognized as a safe replacement for the disconnected products. The current type of ESWA panels have been used since 1963.

Because of public concern, David Cohen, Dean of Law at the University of Victoria, has been appointed by the Brit-



ish Columbia government to help find solutions to problems caused by the faulty radiant ceiling heating panels.

Electric ceiling heating panels consist of thin carbon or metal heating elements encased in plastic films. The plastic film is fastened to the underside of the ceiling framing and is then covered with the vapour barrier and drywall ceiling finish. Thermal insulation is placed above the heating panels, usually in the attic. The ceiling assembly then becomes a radiant heater. These ceiling heating panels operate at temperatures which are not hazardous provided the entire installation is carried out correctly. Strict compliance with the installation instructions for these systems is critical to the safety of the building and its occupants.

A recent fire which originated in the cellulose insulation in the attic with ceiling heating panels identified a potential problem between this type of heating system and some types of insulation.

When wood or wood based products are repeatedly heated over an extended time period they can undergo a chemical change. The degree of change increases with each heating cycle, and results in the progressive lowering of the temperature at which it will ignite. This process is known as pyrolysis. In the fire it appears that pyrolysis occurred in the combustible insulation and it eventually ignited which in turn ignited the adjoining roof framing.

Combustible insulation is not permitted over ceiling heating panels and cellulose insulation, although treated with a fire retardant, is still considered combustible. The instructions for cellulose insulation prohibit its use near heating sources such as ceiling heating panels.

Foil backed insulation also is not permitted over the ceiling heating panels. Installation instructions clearly state that only non-foil-backed non-combustible insulation is to be used over these panels and that the insulation should not exceed R-40.

There are also limitations (such as drywall thickness) on what may be installed on the underside of the heating panels and manufacturers' instructions should be checked. These limitations are to enable the heat from the panels to be transmitted through the ceiling without an abnormal build-up of heat in the ceiling heating panels, adjacent materials and structural members.

The upper surface temperature of the drywall in contact with the heating panels must not under any circumstances exceed 60°C.

One common element with the problem systems is that they use a graphite matrix as the conductor/heating element. It seems that these may at times over heat leading to hazardous conditions within the panel or the busbar.

British Columbia has restricted the installation of all Flexible (Thin Sheet) radiant ceiling heating panels rated over 18 watts/ft².

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. To contact the TRC:
Canadian Home Builders' Association
Suite 200, 150 Laurier Ave. West,
Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214



Letters to the Editor

Sir

Regarding your article on effective ventilation: I have a difficult time accepting that an exhaust-only system with passive ventilation inlet grilles can maintain good indoor air quality.

First, there are some realities about point-exhaust fans with which you already agree: short expected life span and noise. Why should we support a building system that encourages obsolescence from the day such systems are installed? When a bathroom fan dies, it does not always get replaced. From that point onward, the structure experiences a de facto system failure.

And why should we expect homeowners to operate a technology that, in some instances, is too damn loud! (You might want to find out for yourself how well you sleep next to a 4.0 sone bathroom fan that a dehumidistat will activate in the middle of the night.)

Then, there is the issue with passive ventilation vents. In reality, the results of the 1986 Swedish study do not apply to 1994 consumer behaviour patterns in North America. I have heard many ventilation and gas system installers tell me about make-up inlets plugged to reduce cold air entry into new homes. Not only is this an issue with system effectiveness, but it could be a safety issue as well!

In theory, the concept of point-exhaust systems with passive air vents should work. But, in reality, it doesn't. As building technologists, we must accept that homeowner behaviour is a function of system design. Systems are designed for people, and not vice versa.

Bill Kolida
Langley, B.C.

I agree with you that the cheap, loud bathroom fan to provide exhaust only ventilation is not an effective ventilation system, although that is what often passes for ventilation. Make-up inlets that are plugged to reduce cold air entry are obviously not effective passive ventilation inlets, but rather combustion air inlets.

However, exhaust only ventilation systems with properly engineered passive ventilation inlet grilles and good quality fans can be done with sophistication. There are hundreds of thousands of homes with such ventilation systems, mostly in Europe, but also in North America, and they do provide effective ventilation. In many cases these passive systems perform as well as if not better than an HRV system (especially a poorly laid out HRV installation), but they do require the proper use of components and materials. This means that the fan is not the cheap bathroom fan but a high quality, quiet fan (and these do exist, in Europe and Japan), and the passive inlet grilles are not simple holes in the wall, which any homeowner will rightly close off, but rather properly engineered inlets that can control the airflows. Properly designed (passive) ventilation grilles will not create such unwanted drafts.

The sad fact is that most of the industry does not have the tools or expertise to do a proper job. What has been accepted for use with "engineered" systems is often not satisfactory, and that can be anticipated at the design stage.

The average Swedish homeowner keeps their home warmer than in North America, so their expectation of comfort levels is high - they will not tolerate uncontrolled drafts. Homeowner behaviour must be considered in the design, but unfortunately it seldom is. We have information about how people use their home, so part of the system design should be to take into account people's habits! Ed.

Re: Effective Ventilation (Solplan Review, Oct - Nov 1994)

You suggest that an exhaust-only ventilation system with passive intake gills would be difficult to use under the mechanical ventilation requirements now adopted for the 1995 National Building Code. This is not correct. Don't forget that, in addition to the prescriptively-described systems in Subsection 9.32.3., one can also use any system complying with CSA F326. F326 permits an exhaust-only system provided the exhaust as well as the passive inlets are distributed to the rooms required to be ventilated; however, central exhaust cannot be combined with distributed passive intakes. I note that the Swedish research you cite also does not favour this latter combination.

Secondly, your TRC News states that sprinklers will be required in all residential buildings built under Part 3 of the 1995 NBC. Again, this is not correct. Sprinklers will only be required in residential buildings if they are 4 storeys in building height and higher (of any building area) or 3 storeys in building height if they are more than 6000 m² in building area. (Yes, that is 6000 square metres not square feet). This leaves out a large number of buildings (perhaps a majority), particularly if one remembers that a lot of seemingly 4 storey buildings are actually 3 storeys under the Code's definition of building height. Also, given that many of your readers are so concerned about this issue but may not be intimately familiar with the Building Code, I think it might have been advisable to clarify that Part 3 does not apply to detached and semi-detached houses, duplexes and triplexes, most row houses and most low rise apartments. Those readers can take some comfort in knowing that those seeking to have sprinklers made mandatory in low rise housing will find no support in the National Building Code in the foreseeable future.

I hope you find these comments helpful.

John Haysom, P. Eng.
Canadian Codes Centre
Institute for Research in Construction
National Research Council

Unfortunately, performance compliance with the code is difficult to attain in the field as it too often entails extra hoops for the builder to go through. We've

Thoughts From Russia

Sir,
Zdrastvuyti! (How do you do)

Here I am, back in Siberia, and I happened to be going through old files when I stumbled across Solplan Review No. 50. Memories of such a short long time ago surfaces as I read the opening comments from the publisher; R-2000 has lead many of us to many places, how did it lead me here? What is here? How to describe it?

Frustrating is one expression, I sit here and wonder why things are the way they are and how are they very going to change. At one time I was a naive optimist; now I am a realist. It's the ultimate challenge for someone like me. When I first came here, little did I realize how difficult and alien life would be, but I jumped without knowing how deep the water was and how strong the current. It has become my life, Russia is now in my blood!

A chance to participate in a whole new frontier. It is difficult, inconvenient, and frustrating, yet I wouldn't trade it, not yet. I want to contribute, to make an impact. I want to leave something: a memory.

To describe the state of affairs in building construction today, all one has to do is go back 50 years to understand what is going on here. Most construction is either brick or concrete, no attention paid to air or moisture movement. We have the *House as a System*; here they have the house as a disaster. The residential market in Russia is a sleeping giant. Contrary to how

found that some building inspectors are not willing to consider any equivalencies, especially when the code has a detailed prescriptive path.

We wanted to highlight that an effective ventilation system has to be carefully designed, and may take on a variety of designs. Central exhaust systems with distributed passive intakes have proven themselves and are appropriate in some applications, so it is unfortunate that they will not be permitted. Ed.

the negative, bone headed, sensationalistic news media misinforms you: things are progressing here.

I am living in an oil and gas rich region. They have more reserves than Saudi Arabia, they use oil and gas for cash, and the oil and gas companies have to house their employees, but there is a critical shortage of decent housing.

Insulation is almost non existent. For concrete walls they use a hollow ceramic pellet as an insulator. Sometimes the cavity between brick walls is filled with this, but the typical practice is to increase the thickness of the wall to add some insulation value. A total waste of materials and labour.

Windows? In my office I have taped and stapled poly over all my windows except for 2 small openers. I did this to prevent myself and my computer from catching pneumonia.

Central heating? They use district heating. You can follow the main and branch lines in winter. It's a great way to remove snow. (I wonder why they don't run the lines down the roads?) Controls? In November you have to open the windows because it's too hot, only to freeze later because you're too cold! I am sitting 1.5 meters away from the window, but even with the poly, I'm getting a chill (it's only -25°C today).

It's just as bad in the summer, but reversed. The temperatures get to +30-40°C, and I swear to you this cold climate

boy melts. All these concrete buildings become ovens! Lousy cheese cloth screening invites the mosquitoes inside. The windows are so bad that even if you close them, and suffocate, the blood thirsty m---f---ers manage to get inside through the gaps!

Yet the local architects and some builders are frustrated. They are aware of what is going on in other parts of the world. It's a sad state of affairs and one I am now getting involved with. I have been working to import a manufactured house package from Canada to serve as a demonstration house. We have to do this, because the locals don't understand what we are talking about. The notion here is that wood burns, so how can you build a wooden house?

Why import housing? The cost of the unreliable supply of not so great materials here is incredible. The selling price per unit is about \$ 600/sq.m. (US dollars!). I believe even after shipping costs and duty is taken into account, we can still be competitive.

Energy efficiency is becoming a critical issue here. Russia has suspended all exports of heavy heating fuel because they need what they have for their own domestic use. This is a serious economic issue because exports are their main source of hard currency revenue. As shortages increase this means less energy for industrial development, less energy for bakeries to bake bread, food shortages, less energy than already available to inadequately heat apartments, anarchy?

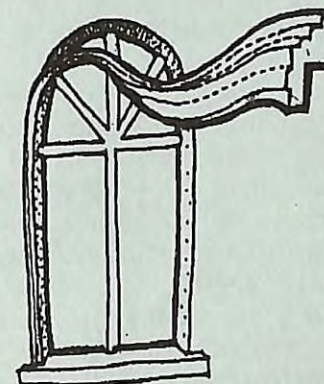
I took a tour of new brick houses being built on the outskirts of Tyumen. Very nice looking units about 300 sq.m on two floors with a basement. They wanted to show me they knew about foreign technology, so they were keen to show me the ultra modern German gas boiler system they installed. It was work of art. Total cost for the system? Only \$25,000 US dollars!

Cheers!

Wayne Sippola
Tyumen, Russia

Flexible Mouldings

Curved walls and round windows are a challenge to finish when doing more traditional finishing work with elaborate mill work. You can steam wood to get the curves, and you can do fancy joinings for baseboards, casings, and crowns, but it can be a painful job for experienced crafts people (who are in short supply).



An interesting product developed in B.C. overcomes these problems. It is a flexible moulding product that looks and acts like wood.

It is very easy to work with, and saves time and expense when being installed, and no primers are needed. It looks like a very stiff cream coloured dough and is available in any profile desired, as it is manufactured in moulds from a gypsum and vegetable oil based product. The product is fire retardant and best of all, it is an environmentally friendly, so there are no emissions as you get from many synthetic plastic materials.

The product was developed by Accuflex Products Inc. and is distributed by Parwood Distribution Incorporated
Tel: (604) 525-1101
Fax: (604) 525-4202

Electronic Access Building Products Directories REDI Guide™ and Energy Source®

Information on over 1000 "green" building products from throughout the United States. This directory provides construction professionals with fast, computerized access to recycled, low toxicity, natural and sustainably harvested building materials.

Products are listed by manufacturer name, brand name, product category, region of distribution and key word.

The 1995 Residential Energy Source Directory is also now available on computer diskette.

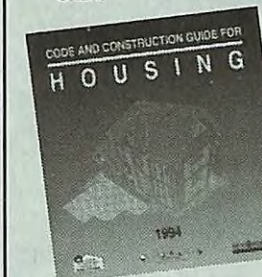
Information for both is current for 1995. Price of each: U.S. \$ 49.00.

Information:
Iris Communications, Inc.
Eugene, Oregon
Tel: 503-484-9353
Fax: 503-484-1645



Canadian HOME BUILDERS Association of British Columbia

Offers a range of Services designed to enhance the overall professionalism of the Residential Construction Industry in British Columbia

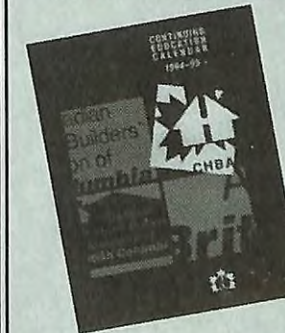


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The Great Canadian Reno-Demo Project

We've been giving progress reports on your editor's renovation project of a turn of the century house in North Vancouver City. The intention is to demonstrate the potential of recycling housing stock by incorporating the latest in energy efficient and environmentally healthy construction approaches suitable for new and retrofit construction by the addition to and development of the original unfinished basement to incorporate a walk-out basement suite.

In the past few issues we've focused on the structural and mechanical features. The construction is nearing the end (finally!), so this time we're focusing on some of the finishing touches, and how they contribute to a healthier environment. (Next issue, we may even have some pictures!).

Why Renovate?

Most of the housing of the year 2020 has already been built. The Great Canadian Reno-Demo Project, aside from providing necessary living space, is recycling the existing house rather than leveling the house and building a new structure, as is so common a practice today.

Interior Finishes

A more healthy indoor environment

will be attained through the selection of low emission materials and finishes to reduce the pollutant load in the new dwelling.

The walls are conventional drywall and wood trim. Some special-dimension trim boards and window sills were made of medite II, a medium density fibreboard that does not use urea formaldehyde glues. The paint finishes are taking advantage of no VOC emission paints (primer and finish paints) manufactured by **Colour-Your World Paints**. These are available in a range of finishes for various applications. The no VOC paints, however, are limited to very light pastel tints. Deep tints can be mixed, but they do have some short term emissions.

The floor through-out the new suite is ceramic tile, chosen as much because of its inherent, low emission properties as for the low maintenance and attractive finish. There are no concerns about cold floors as the space heating is floor radiant.

The cabinets are finished with plastic laminate on a base made with medite II. The manufacturer, Enviro-safe Cabinets, has set out to be environmentally responsible. They have been careful to research not just the material for the finishes and the glues, using low emissions products, but even going so far as to check out the source of the raw materials used by the

manufacturer's of the hardware. The day the cabinets arrived there wasn't the usual pungent smell you get with standard particleboard cabinets.

Lighting

In keeping with the energy efficient theme, most of the lighting is energy efficient; compact fluorescent for general lighting and hallway areas; T8 fluorescent fixture for the bath vanity, and halogen lights for accent lighting.

Outdoor soffit lighting is conventional recessed fixtures (compact fluorescent fixtures are still outrageously expensive) but we will be using screw-in compact fluorescent lamps in the conventional fixtures. Fluorescent lighting for exterior use, especially in a sheltered area like the soffit, is acceptable in the Vancouver climate, although it is not an appropriate lighting type in very cold climates as fluorescent lamps are sensitive to cold temperatures.

Sitework

In order to reduce on trucking, a portion of the excavated materials are being used on site to re-contour the property. The intent is to incorporate new plant material making use of native and drought resistant plant materials, and minimize lawn areas.

Brick garden walls are recycling bricks from the original furnace chimney that was removed because there is no longer any need for it. ☼

insulation, and the finished floor can be isolated from the concrete, thus allowing the subfloor area to be vented (e.g. for moisture, soil gases, radon, etc).

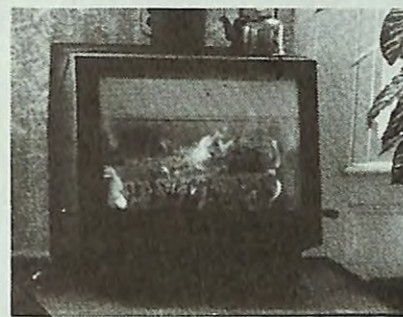
The distributor quotes a cost of around \$0.50 per pin, for a cost of around \$2.00 per square foot.

Information:

*Carpus Investments,
North Vancouver, B.C. Tel 604-984-4114; Fax 604-984-4105*

A European sub-floor levelling system is being introduced by a North Vancouver company. It consists of a series of adjustable plastic pins that are screwed into wood sleepers. Concrete pins anchor the assembly to the slab. As the sleepers are effectively floating, any unevenness in the concrete can be compensated for by adjusting the height of the sleeper. The space between sleepers can be filled with

New Woodburning appliance design



- Compared to the VC Defiant Encore
- Equal fuel capacity
 - 10% more efficient
 - 130% more glass area
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 - 25% smaller flue
 - No catalyst - No gaskets
 - Optional gas burner
 - 35% less expensive
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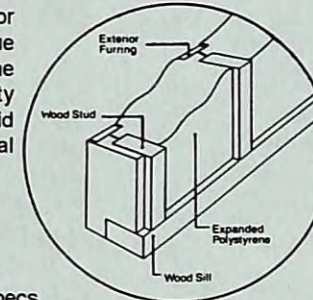
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INSUL-WALL is available as a preassembled wall structure, or pre-cut component package for on-site assembly. This unique panel system incorporates the use of high quality environmentally pure, EPS rigid insulation with conventional wood framing.

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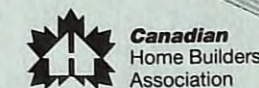
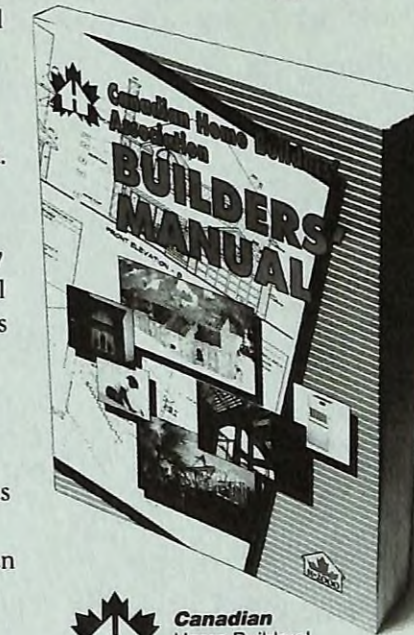
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Ontario Newhouse Building Systems 49 Stevenson Cr. Renfrew, ON K7V 1J4 Tel: 1-800 257-4424	Alberta, BC, NWT, YT & Western Saskatchewan Beaver Plastics 12150 - 160th St. Edmonton, AB T5V 1H5 Tel: (403) 453-5961 Fax (403) 453-3955
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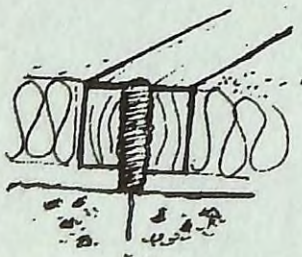
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* The CHBA is a voluntary private-sector organization which represents the residential construction industry in Canada.

Floating Sub-Floor: the Nivell System



Coming Events

February 17 - 19, 1995

JLC-LIVE: The Construction Business & Technology Conference. The Journal of Light Construction will hold its first comprehensive conference in Boston.

For information: The Journal of Light Construction at Tel: 1-800-552-1952; or write The Journal Of Light Construction, RR #2, Box 146, Richmond, VT 05477.

Heating, Refrigerating And Air Conditioning Institute Of Canada (HRAI) has published their 1995 Winter/Spring Course Schedule. Courses include: Residential Mechanical Ventilation Installation (2 Day Course); Residential Mechanical Ventilation Design (2 Day Course); Residential Heat Loss & Heat Gain Calculation (3 Day Course); Residential Air System Design (3 Day Course); Small Commercial Heat Gain & Heat Loss Calculations (3 Day Course). Information: Tel: 905 602-4700 or 1-800-267-2231

May 10 - 12, 1995

Indoor air Quality, Ventilation and Energy Conservation in Buildings 2nd International Technical Conference. Montreal, Canada Organized by Centre for Building Studies Concordia University
Tel: (514) 848-3200
Fax: (514) 848-7965

June 5 - 6, 1995

Window Innovations '95, Toronto, Ontario An International Conference on Window Technologies for Energy Efficiency in Buildings; sponsored by Natural Resources Canada/CANMET in cooperation with the International Energy Agency.

Information: Darinka Tolot
Natural Resources Canada/CANMET
580 Booth Street, Ottawa, Ontario K1A 0E4
Tel: (613) 943-2259
Fax: (613) 996-9416

December 4 - 8, 1995

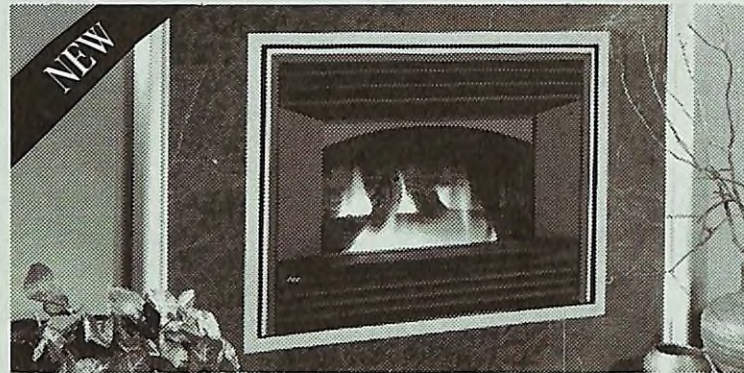
Thermal Performance Of The Exterior Envelopes Of Buildings VI. Research, advanced technologies, new concepts, practical applications and case studies.

Oak Ridge National Laboratory
Thermal Envelopes Conference
Box 2008, Bldg 3147
Oak Ridge, Tennessee 37831-6070
Attn: Pat Love

OOOPS!

In the Oct - Nov 1994 issue of Solplan Review we featured problems associated with stucco finishes. Unfortunately, we overlooked giving credit to the New Home Warranty Program of BC for providing background material including the list of stucco problems. Our apologies.

Introducing the New Legend Direct Vent Fireplace



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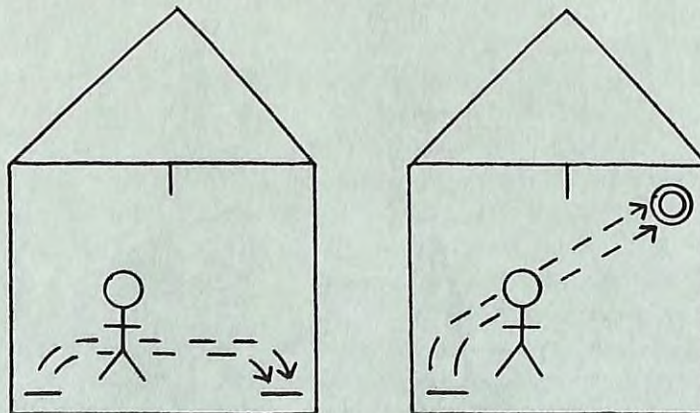
The new Legend with top or rear venting models, can be installed almost anywhere: in the corner, basements, or on an outside wall. It uses no electricity and has variable heat settings. Valor has the highest radiant heat output with over 1400 sq. inches of heat exchanger to convect heat naturally without need of a fan.



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Electric Heating Guidelines

"Rule-of-thumb approaches to heat loss design are not acceptable under the B.C. Building Code."

Steve Gertsman
Chief Building Inspector
Corporation of Delta

Over the past 20 years, higher insulation levels and reduced air leakage have tremendously improved the energy efficiency of new homes. However, heating systems in most new homes are being designed with unsanctioned rule-of-thumb approaches. As a result, some heating systems today are being oversized by 100%.

These situations can be avoided with a proper heat loss calculation. This was one of the reasons why BC Hydro created the *Electric Heating Guidelines*.

The *Guidelines* contain a unique collection of design and installation information on electric space heating equipment. Developed with input from industry, this booklet covers a wide range of topics - from the basics of heating comfort to installation guidelines for six types of electric heating systems.

The most important section of the *Guidelines* deals with heat loss calculations. This is where contractors will find an easy-to-read discussion on heat loss design, along with a complete step-by-step walk through of a whole house calculation.

"The timing of this booklet is excellent," says Bill Kolida, the consultant who developed the *Guidelines* for BC Hydro. "With proposed national energy code regulations calling for mandatory heat loss calculations on all new homes, heating contractors will very soon need to know how to do a heat loss calculation. This booklet will be a great help."

Not only will the *Guidelines* encourage more efficiently designed heating systems, but they will also support improved utility load management for BC Hydro.

"Each year, there are thousands of electrically-heated homes built in B.C. All the oversized kW's add-up," states Bruce Main, B.C. Hydro Building Operations Manager.

"By reducing our system capacity requirements, we can also reduce our investment in new generating facilities."

In support of reducing the number of oversized heating systems, the *Guidelines* are being strongly promoted by the Power Smart New Home Program. According to George Crowhurst from Power Smart, "all builders who choose to build electrically-heated homes must design the heating system to standards found in the *Guidelines*"

There has been strong industry support for the *Guidelines*, largely because industry played a key role in developing them.

"Everything in this booklet makes sense and it's easy-to-read," says Christy Mereigh, Wespac International Contractors.

For the progressive electric heating contractor, the *Guidelines* are a "must read". Carry it in your tool box or put it on the book shelf - this booklet is excellent reference on electric space heating. And it's reasonably priced at \$29.95 (plus GST in Canada).

This book will really heat up your job satisfaction.

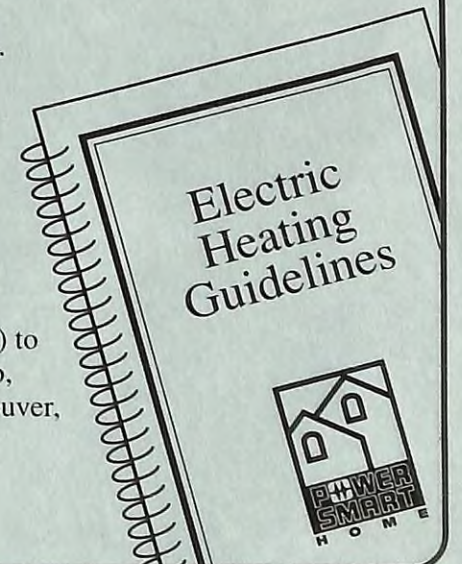
Everything you need to know about sizing and installing electric heating equipment—in language you can understand.

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- easy-to-read installation guidelines.
- high-performance thermostats recommended by Power Smart.
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To order your copy of *Electric Heating Guidelines*, please send a cheque or money order for \$32.05 (includes GST, postage and handling) to Communication Services, B.C. Hydro, 475 W. Georgia St., 3rd Floor, Vancouver, B.C. V6B 4M9.

BC Hydro



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